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Source: *The Scientific Monthly*, Vol. 45, No. 2 (Aug., 1937), pp. 97-100

Published by: [American Association for the Advancement of Science](#)

Stable URL: <http://www.jstor.org/stable/16473>

Accessed: 08/05/2014 22:16

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# THE SCIENTIFIC MONTHLY

AUGUST, 1937

## CONTRIBUTIONS OF THE MELLON INSTITUTE TO THE ADVANCE- MENT OF SCIENCE<sup>1</sup>

### A NATIONAL ASSET

By Dr. KARL T. COMPTON

PRESIDENT, MASSACHUSETTS INSTITUTE OF TECHNOLOGY

It is a natural law, supported by both logic and experience, that it is the useful which survives. It is to their fundamental social value that such institutions as family, church, university, business and government have existed from time immemorial, each supplying an essential ingredient of that complex compound of mankind in the aggregate that we call society. Though changing in form to meet changing conditions and styles of living, these institutions continue to perform the essential functions respectively of reproduction, spiritual satisfaction, education, distribution and regulation.

It is important to note the ever-changing form and performance of these institutions, even though their basic function remains unaltered. The family in the days of Abraham, Isaac and Jacob was differently organized and faced different problems than the typical Pittsburgh family of 1937. Governmental authority has been variously vested—through personal physical prowess or conquest or heredity or purchase or demagogic persuasion or election by the people. Business has developed from the days of

barter and hand labor to the present era of monetary transactions, mass production and high pressure distribution. Universities have changed vastly in their curricula and methods of instruction, but they are still devoted to the three original objectives: disciplined intellect, professional skill and new knowledge.

Our attention on this auspicious occasion is naturally directed toward two of these basic institutions, the university and business, since the Mellon Institute is derived from both and serves the public through both. I suppose that it would be proper to designate the Mellon family as the father of this institute, its parenthood made possible by success in business. Likewise the institute's mother is the University of Pittsburgh, within which it has developed and been reared to take its prominent place as an active member of that important group of institutions which perform essential national service in education and research.

A number of influences converge at the present time to enhance the value of the Mellon Institute and other institutions which perform similar functions, and of these influences I would speak briefly as follows.

In the first place, the Mellon Institute

<sup>1</sup> Based upon addresses presented at the time of the dedication of the new building of the Mellon Institute of Industrial Research in May.

is a scientific institution, and science is at the very root of our national program of objectives which our President has phrased as "the more abundant life." True, we do not see science advertised as an objective in political party platforms or even in the President's own messages to the Congress or to his friends, the people. It is even likely that few of those who are urging the various measures for improving the social and physical aspects of the nation have any real understanding of the fundamental rôle that science must play if these measures are to be successful. Yet this rôle exists, as the following analysis shows.

Prominent among our avowed national objectives are: the banishment of disease; elimination of unemployment; higher standard of living, including higher wages, shorter hours and greater opportunities for comfort and recreation; abolition of child labor; educational opportunities for all; social security against economic hazards or distress in old age; protection against natural hazards of flood, drought, wind, fire and earthquake; new markets for agricultural products.

I make bold to assert, for I believe that it can easily be proved, that there is not one of these fine objectives but that is basically dependent on science for its achievement. Take, for example, higher wages and shorter hours. Real wages are composed, of course, of all the things which a worker gets in return for his labor. In the last analysis the total wages which can be paid consist simply in the total number of necessary and desirable things which are produced in the world. Every new and useful product developed by science adds just so much to the sum total of real wages, and every machine for increasing production makes possible either more wages or shorter hours of labor or both.

It is a pity that so many of our social and political reformers have not evolved much beyond the "cave man" stage in their thinking. From the days of the

cave man, all through history up to the modern era of science, there were only two primitive recipes for achieving the "more abundant life." One was to work hard and long in order to produce more; the other was to take the good things of life from some one else—by conquest or theft or taxation or exploitation. Too much of the doctrine of the more abundant life, even in our day, is based on the latter one of these primitive philosophies. To work hard and long to improve our lot has gone out of style; now the slogan is to soak the rich and to demand more while giving less.

Over against such primitive, though still popular, methods of seeking the good things of life, there is the sharp contrast of the modern method of putting science to work for us. If, by a practical application of science, men are enabled to produce with tenfold rapidity, it is evident that they can get along on their former standard of requirements, by working only one tenth as long as they had previously done. Or, if they want to work half as much as they did before, they will still produce five times as much as before, so that the average man's real wage will consist of the products of five times as much labor as he used to enjoy.

This is the basic philosophy of science as a means toward social betterment. Science creates new materials, new methods and new opportunities. There is real danger that, in the present activity of labor to demand more wages and of government to demand more taxes to support its altruistic aims, the demands may exceed the supply. In other words, demands for wages and taxes may exceed the capacity of industry and agriculture to produce. The only hope in such a situation is for science still further to add to man's ability to produce desirable things. In fact, had it not been for the past achievements of science, our wages and standards of living would still be, for the masses of the people, at the primitive levels of constant struggle against starvation and suffering.

Let me give a very up-to-date example of the social values of science. It is an old story, of course, that the automobile industry has provided enormous employment at about the highest wages of any large industry in history, and that the automobile has opened up new opportunities of living, recreation and achievement to millions of people. Here, however, is a more recent aspect. The number of automobiles sold in the past year in America was approximately equal to the number sold in the last boom year of 1929. By all measures, the new car is at least 50 per cent. better than that of 1929—in economy of operation, safety, comfort and general quality. Yet I am informed that the aggregate cost to the public of the present cars was \$700,000,000 less than in 1929. So Mr. Citizen has a much better car and has saved \$700,000,000, which he can spend for something else that he wants, such as a better home, more delicious food, travel, books, life insurance, clothes or a thousand and one things which altogether signify the "more abundant life."

The state of civilization of a people has been defined by the degree to which they are willing to sacrifice present pleasures for the sake of future benefits. If we all were really highly civilized and intelligent, we would see some striking contrasts to our present situation. We would see labor unions demanding the introduction by all industries of labor-saving and rapid production machinery in order that they might achieve higher wages and shorter hours. We would see the political forces of the country even more insistent in demanding the creation of new wealth than its distribution. In times of economic stress we would see the government strengthening its scientific services instead of curtailing them most severely of all services. We would see the agricultural problem tackled by a powerful scientific attempt to discover new uses for agricultural products rather than trying to achieve prosperity by curtailing pro-

duction. We might even see income taxes which would encourage, rather than suppress, the man who creates a great and useful industry and who uses his wealth in a far-sighted manner for the public good.

Unfortunately our state of civilization, as a group, still falls far short of any such Utopia of intelligence. But fortunately there are some individuals who have vision, understanding and altruistic spirit who have also the ability and initiative of leadership, and who therefore supply those essential elements of progress which are lacking in the body politic. It is to such men that the world has always owed its slow but steady rise from barbarism to its present state of semi-civilization and improved standards of living. It is to such men that the world owes this Mellon Institute, which has already contributed so notably to our national welfare and which is to-night signaling a new era of even greater accomplishment.

Since we all understand in a general way the functions of the Mellon Institute, and since there are many here more competent than I to discuss its operations in detail, I will confine my comments simply to a statement of its basic significance.

I have already spoken at length of the basic rôle of science in any program for social progress. Science's rôle extends all the way from the first observations of the facts of nature, through experiment and theory and still more experiment, past the formulation of proven principles, on through the practical applications of these forces and materials of nature for the benefit of mankind. These operations of science on a significant scale are fostered primarily by two of the institutions whose stable and essential character I remarked in the beginning—the universities and business. For it is in the universities, to a far greater extent than anywhere else, that the basic facts of science are discovered and studied, and

it is there that the scientists themselves are trained. And it is business enterprise which organizes for the efficient production of the materials produced by science or which uses these materials for the performance of such essential functions as transportation, communication and other public services. Many progressive business organizations have built up great scientific organizations of their own, to conduct research and development of their own products.

The Mellon Institute fits strategically into this scheme, midway between the university and industry. In it the scientific discoveries made in the universities may be examined and developed with reference to their possible industrial value; in it the technical troubles of industry may be cured and its ambitions for new and better products or methods satisfied by the aid of science. It serves also as a training ground and recruiting center for applied scientists who will later be absorbed into industrial organizations. It provides the facilities of a research laboratory to the thousands of industrial units which have not as yet been able to justify the establishment of research laboratories of their own. In many cases, it demonstrates to an industry the advantage of creating its own permanent laboratory, as, for example, in the case of the now

great research organization of the Gulf Oil Company, which originated in a research project at the Mellon Institute.

In the light of all these facts, facts of experience and facts of the present situation, and in a time when a crying need of the country is for the development of new industries, new uses for farm products, new forms of wealth that people will work and pay to possess, I can think of no better designation of this great institute, in which university and business unite to serve the nation through science, than to say that it is a "national asset." The Mellon Institute is performing a function which the government is not and probably should not be performing. But this function is so important that this institute and all other institutions which are similarly contributing to improve the general standard of living in basic ways through science should be encouraged and aided in every possible way by favorable legislation and private philanthropy.

As a representative of a sister institution which follows the same ideals, I offer congratulations and best wishes to the University of Pittsburgh and to its Mellon Institute at this celebration of its increased effectiveness, and I would express to the Mellon family my sincere conviction that their generosity has been well conceived in the public interest.

## RECENT PROGRESS IN SYNTHETIC ORGANIC CHEMISTRY

By Dr. G. O. CURME, JR.

VICE-PRESIDENT, CARBIDE AND CARBON CHEMICALS CORPORATION

I HAVE always thought of the Mellon Institute as one of the spots in the world where new scientific discoveries are most sought for and best appreciated. Accordingly, it seems quite appropriate that this discussion of recent progress in science should be held here, where the accomplishments of scientists from all countries are constantly under review. I doubt if I can add any wholly new scientific facts

of particular moment to the store already available. Valuable discoveries, when they become definitely established as representing progress, are always well known. The really new ideas that will be acclaimed in years to come are now being worked upon by those who have faith in them but are obscured by the great mass of accumulated scientific knowledge. I hope, however, that a re-